

CONGDON CANAL, FISH SCREEN
Naches River
Yakima Vicinty
Yakima County
Washington

HAER NO. WA-114-A

HAER
WASH
39-YAK.V,
2A-

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

Historic American Engineering Record
National Park Service
Western Region
Department of the Interior
San Francisco, California 94107

HISTORIC AMERICAN ENGINEERING RECORD

CONGDON CANAL, FISH SCREEN

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Location: Right bank of the Naches River near South Naches Road at the south end of Eschbach Park, ca. 7 miles northwest of Yakima.

U.S.G.S. 7.5 Minute Series, Naches Quadrangle, Yakima County, Washington.
Universal Transverse Mercator coordinates:
10.679530.5171460

Date of Construction: Circa 1927

Engineer: Charles Cobb

Builder: Yakima Valley Canal Company, Yakima, Washington

Present Owner: Yakima Valley Canal Company
1640 Garrettson Lane
Yakima, Washington 98908

Present Use: Irrigation canal intake fish screen; to be replaced

Significance: The apparatus is the earliest known, and continuously operated, rotary-drum fish screen in the south-central Washington region. In 1926, active enforcement of a 1905 Washington State Fisheries Code law produced a deluge of inventions and experiments with fish screen/stop devices that lasted well into the 1930s. Around 1927, Charles Cobb, of the Yakima Valley Canal Company, fabricated and installed an ingeniously simple, self-cleaning, self-propelled, prototype rotary-drum fish screen. The screen proved to be so successful that it is still in use. It may have significantly influenced generations of rotary-drum fish screen designs that are commonly in use today. The Congdon Canal Fish Screen was determined eligible for the National Register of Historic Places in January 1991.

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Introduction

Situated in an irrigation canal drawing its water from the Naches River west of the city of Yakima, Washington, the Congdon Canal Fish Screen operates seasonally, that is during irrigation season from about late March until early October, to prevent fish entering the irrigation system from the Naches River. A tributary of the Yakima River, the Naches is renowned as a migratory salmon and steelhead habitat stream prized as much for its fishing as for the abundant amount of water it provides for irrigation in the Naches and Yakima valleys. Maintaining healthy fish runs in the Naches has been a concern since migratory fish populations began to decline about the turn of the century. The fish screen in the Congdon Canal was installed as one of the many measures to ensure the viability of fish runs in the Naches River.

In accordance with new criteria developed for the design and functioning of fish screens, the U.S. Department of the Interior, Bureau of Reclamation, in cooperation with the U.S. Department of Energy, Bonneville Power Administration (BPA), has undertaken the task of constructing a new fish screen facility for the Congdon Canal diversion. The action is part of BPA's mandated project Fish Passage and Protective Facilities, Phase II, Yakima River Basin, Washington.¹ Studies in preparation for Phase II indicate that the present Congdon Canal Fish Screen is inadequate in performing its required function. The perpendicular position of the screen to the water flow, as well as the lack of an efficiently operating bypass channel, has made the system obsolete to new standards of fish protection. The excessive speed of screen rotation, and the turbulence it causes, together with the lack of on-site maintenance capability, adds to the advisability for the system's replacement.²

In 1991, the Congdon Canal Fish Screen was determined eligible for inclusion in the National Register of Historic Places by the Washington State Historic Preservation Officer.³ As required by Federal law, a determination of adverse effect based upon the proposed replacement of this historic property

¹U.S. Department of the Interior, Bureau of Reclamation, and U.S. Department of Energy, Bonneville Power Administration, Fish Passage and Protective Facilities, Phase II, Yakima River Basin, Washington: Predesign Memorandum - Congdon Canal Fish Screen Facility (Bureau of Reclamation, Boise, Idaho, January 1991), pp. 1-2.

²Ibid., pp. 3-4.

³Keo Boreson, "Congdon Canal Fish Screen," (Determination of Eligibility, National Register of Historic Places, Archaeological and Historical Services, Eastern Washington University, Cheney, Washington, 4 October 1990); Leonard T. Garfield, Office of Archaeology and Historic Preservation (OAHP), Olympia, Washington, to Phillip D. Havens, BPA, Portland, Oregon, 16 January 1991.

was made in 1992,⁴ after which the Bonneville Power Administration was required by the National Park Service to mitigate the adverse effect on the Congdon Canal Fish Screen by documenting it in the Historic American Engineering Record. This document is submitted in compliance with that request.⁵

In 1991, the Board of Directors of the Yakima Valley Canal Company voted to donate the historic Congdon Canal Fish Screen to the Central Washington Agricultural Museum in Union Gap, Washington. The museum plans to build an exhibit wherein the fish screen will be an integral part of teaching the history of agricultural development in the region.⁶

DESCRIPTION

Paddle Wheel. This feature consists of an axle set in bearings attached above the concrete canal wall (see photo 10). The wheel is about 8 feet wide, with three sets of twelve radiating angle iron spokes connected to twelve wooden paddles (8' x 2" x 12"), and reinforced by two concentric metal rings on the outer spoke assemblies (see photo 4).

Drive. The east end of the wheel axle is enclosed in a metal box and holds the gear mechanism, consisting of two interlocking, beveled gears, perpendicular to one another, one on the axle and one at the end of a 23-foot drive shaft (see photo 10). The drive shaft runs along the east edge of the canal, and is held in place by three journal bearings, one at each end, and one on the drum side of a universal joint (see photo 12). A second set of interlocking, beveled gears are positioned above the east end of the drum screen perpendicular to one another, one at the drive shaft end, the other at the mid point of a short shaft. The short shaft is held in place by a journal bearing west of the bevelled gear. The east end of the short shaft holds a sprocket gear, connecting a drive chain to a sprocket gear on the east end of the drum screen axle (see photos 11 and 13).

⁴Robin Bruce, "A Finding of Adverse Effect for the Bonneville Power Administration's (BPA) Proposed Congdon Fish Screen Improvements Project, Yakima County, Washington" (Archaeological and Historical Services, Eastern Washington University, Cheney, Washington, February 1992); Leonard T. Garfield, OAHP, to Phillip Havens, BPA, 10 April 1992.

⁵David W. Look, National Park Service (NPS), San Francisco, California, to Phillip Havens, BPA, 7 May 1992.

⁶Robert L. Eschbach, Central Washington Agricultural Museum Association, Washington Agricultural Museum, Union Gap, Washington, to Marvin E. Nelson, Project Engineer, BPA, Yakima, [n.d.]; Marvin E. Nelson, BPA, to Craig Holstine, Archaeological and Historical Services, Eastern Washington University, 24 February 1992.

Drum Screen. The drum screen consists of a reinforced metal framework, about 7 feet in diameter and 12 feet long. It is covered by a 1/8-inch mesh screen. The drum screen axle rests in bracketed bearings at either end. An angle iron cross bar lays horizontally over the drum screen connecting the brackets (see photos 7 and 8).

Valve Gates. Two valve gates are positioned between the drum screen and the paddle wheel, and are connected by two screw shafts holding the tongue-in-groove gate boards at the lower end. The screws are operated by rotating, horizontal wheels fixed to two horseshoe-shaped brackets from above (see photo 9).

Casement. The mechanism is set in a reinforced concrete canal, with walls 15 cm in width. The entire course, except for the paddle wheel, is covered by planks (2" x 10"), with a vertical, wooden guard wall upstream of the paddle wheel (see photos 1 and 2).

HISTORICAL BACKGROUND

In the last quarter of the nineteenth century, the Yakima Valley was the traditional home of Yakima Indian people and the new home of prosperous independent homesteaders of European descent. The two groups have lived in relative peace and harmony since the end of hostilities in the late 1850s and establishment of the Yakima Indian Reservation. A place of natural wealth and beauty, the valley displayed its potential in rich, volcanic soil, ample supply of water from the Yakima River and tributary streams, and untimbered valleys and hills.

The advent of railroads to this region attracted the notice of entrepreneurs and financiers of vision and opportunity, heralding the arrival of modern agribusiness.⁷ One of those entrepreneurs was Chester Adgate Congdon of Duluth, Minnesota, who first visited the Yakima Valley in 1887.⁸ Congdon, with his vast investments, holdings, and financial connections, was able to bring the necessary resources to bear in solving the problem of irrigating the area west of Yakima. He realized that the area between the Naches River and Ahtanum Creek could be made arable and profitable if water could be brought past numerous natural obstacles. After some dissatisfaction with local engineers, he prevailed upon his brother-in-law, Alfred Bannister of Alameda, California, to design and construct an irrigation

⁷Lisa Soderberg, "OAHF Inventory: Yakima Valley Canal Company System" (Olympia, Washington: Office of Archaeology and Historic Preservation, 1983), p. 1; Emmett K. Vande Vere, "History of Irrigation in Washington" (Ph.D. dissertation, University of Washington, 1948), p. 44-46.

⁸W.D. Lyman, *History of the Yakima Valley*, 2 vols. ([n.p.]: S. J. Clarke Company, 1919), 2:35.

canal. The canal was completed in 1895,⁹ at a length of 15 miles, serving 3,000 acres. A few years later, in 1902-1903, the canal was extended seven miles and served an additional 1,000 acres.¹⁰

Originally the canal was earth-lined, with wooden flumes and trestles, and a huge wooden syphon traversing Cowiche Canyon. In 1912, Edward Bannister, Alfred's son, was engaged by the Yakima Valley Canal Company to rebuild the canal with a concrete lining and reinforced concrete flumes of the latest design. Some of the distance needed to be constructed in "bench," or covered, flumes due to the common occurrence of rockslides along its often precipitous route. This engineering feat was remarkable for its time.¹¹

In the early years of the twentieth century, with the increased development in agriculture and industry in the Pacific Northwest, concern for the dwindling numbers of anadromous fish in the Columbia River watershed began to mount.¹² Private and public fisheries had existed for some time; however, the Washington State Department of Fisheries and Game had little resources or legal clout to protect either natural or fishery-raised salmon.

In 1905, the state legislature passed a bill "providing for screens at head of irrigation flumes or ditches."¹³ Enforcement of the law proved difficult due to the lack of efficient technology to solve the problem of clogging.¹⁴ Later, the law was repealed and a new, more enforceable law was passed

⁹Charles E. Boone, "Chester A. Congdon: Pioneer Irrigationist" (unpublished manuscript, Yakima Valley Canal Company, Yakima [1969]), pp. 1-5; *Yakima Herald*, "Glimpse of the Valley's Past," 7 November 1965, p. 6D; *Yakima Daily Republic*, "A Desert To Bloom," [Spring] 1895 [no m/d or p], article clipping from files of Yakima Valley Canal Company.

¹⁰S.O. Jayne, "Irrigation in Yakima Valley, Washington" (Washington, D.C.: U.S. Department of Agriculture, 1907), pp. 28-29.

¹¹B.A. Etcheverry, *Irrigation Practice and Engineering* (New York: McGraw-Hill Book Company, 1915), pp. 168-69, 191-94; Soderberg, "OAHP Inventory," [pp. 2-3]; Lyman, *Yakima Valley*, 1:361.

¹²Anthony Netboy, *The Columbia River Salmon and Steelhead Trout: Their Fight for Survival* (Seattle: University of Washington Press, 1980), pp. 34-35; *Yakima Morning Herald*, "Form League To Protect Salmon," 5 November 1922, p. 16.

¹³*Session Laws of the State of Washington*, 1905 (S.B. No. 82), Ch. 79, pp. 143-144; *Pierce's Washington Code*, 1905, Section 5306h, pp. 906b-907.

¹⁴*Spokesman Review*, "Screen Saves Fry in Ranch Ditches," 14 March 1911, p. 9.

in 1915.¹⁵ But it was not until 1926 that active investigation and enforcement was attempted under the direction of Charles R. Maybury of the Department of Fisheries and Game.¹⁶

It was in the mid-1920s that an idea for a self-cleaning, self-propelled, fish screen began to develop in the mind of Charles Cobb of the Yakima Valley Canal Company¹⁷ (see photos 14 and 15). Since enactment of the 1905 law, many inventions and experiments with fish screen devices had been tried. The intake of the Congdon Canal had an electric fish screen installed at one time, but proved to be ineffective.¹⁸ However, experiments with electric and mechanical fish screens continued into the 1930s in the region.¹⁹

Working over a three-year period, Charlie Cobb perfected his mechanical screen design, then constructed and installed it at its present location sometime between 1926 and 1929. As the concept was experimental, he may well have removed and modified it during this period.

The screen is of ingeniously simply design. Originally totally gear-driven, its power source is a paddle wheel (see photo 4) connected by a long drive shaft that turned a screen-covered drum (see photos 5, 6, and 7), that rotated counter to the current. The permeable screen allowed adequate water flow while blocking the entry of fish. The counter-current rotation allowed small debris to be carried over the screen, eliminating build-up. A vertical grate, or rack, (see photo 3) was positioned in front of the screen to prevent damage by large debris during spring run-off or flood. A diversion pipe was positioned before the screen to allow fish to escape from the obstacle in strong current, and flowed into an overflow channel which led back to the river. Two valve gates (see photo 9) were installed between the paddle wheel and the drum screen to regulate the flow or shut it down completely.

Charlie Cobb's design included on-site maintenance capability. A winch-gantry was positioned over the machine, midway between the drum and wheel. Spanning bars, hinged at the base of the gantry,

¹⁵*Sessions Laws of the State of Washington*, 14th Session, January 11 - March 11, 1915, Section 77, pp. 100-101; *Remington's 1915 Codes and Statutes of Washington*, Vol. 1, Section 5150-77, pp. 1846-47.

¹⁶Charles R. Pollock, Supervisor of Fisheries, to Charles R. Maybury, Director of Washington State Department of Fisheries and Game, correspondence, 14 October 1931.

¹⁷Interview with Mildred Vander Houwen, daughter of Charles Cobb, Yakima, Washington, May 1992.

¹⁸Interview with Eugene Eschbach, raised on the family property adjacent to Congdon Canal intake, Richland, Washington, August 1992; Interview with Robert L. Eschbach, owner of and resident at the family property, Yakima, Washington, August 1992.

¹⁹*Yakima Morning Herald*, "Fish Dam Work Now Under Way," 26 October 1922, p. 8.

ran out to the paddle wheel and connected at the axle on each side, pivoting the wheel out of the water when raised by the ratchet and connecting cables. The drive shaft was equipped with a universal joint at the pivot point. A vertical hoist extraction was accomplished for the drum screen by adjacent posts positioned perpendicular to the axle and the cross-beam winch gantry above.

Over the years, the drum screen mechanism was serviced several times. In 1958, John Shannon, Charlie Cobb's assistant and successor, made a major overhaul. The maintenance hoist mechanism was eliminated, both for the paddle wheel and for the drum screen; cranes were required for removal thereafter. The drum was recovered with new mesh, and several of the original wooden components were replaced with metal, including the spokes of the paddle wheel. Most of the roller bearings were replaced with ball bearings. The diversion pipe was replaced and a gate valve installed.

In the 1980s, a few major changes were made. The paddles on the water wheel were changed, the wood having been damaged by beavers. A new drum drive system was installed, replacing the old drum-circumference gear with a chain and sprocket system (see photo 13), requiring repositioning of the beveled drum screen gears to maintain the counter-current rotation. About 1989, the Washington State Department of Fisheries replaced the drum screen mesh covering with the new one-eighth inch mesh,²⁰ as required by regulation.

Charles Cobb, a native of Wyoming, came to Yakima in 1889. As a young man of 19, he began work at the Yakima Valley Canal Company in 1902, and by 1905 he became superintendent of its shops, and lived in a house nearby provided by the company. He retired in 1954, after 46 years of service, and died in December of 1956 at age 75.²¹

Lacking formal education as an engineer, but having about 25 years of work experience, Cobb invented his rotary drum screen in the mid-1920s. A controversy concerning the originality of his invention soon arose. According to Cobb's daughter, Mildred Vander Houwen, and John Shannon, Cobb's apprentice, he applied for, but never received, a patent for his invention.²² Unfortunately, under federal law, all patent applications are private, and the documentation is destroyed after a period of time if the patent is not granted.

Sometime after Cobb installed his fish screen, another rotating drum system, called the "Old Oregon" design, was built and installed in the Wapato Irrigation Project Canal along Ahtanum Creek. The state and federal departments of fisheries and the Bureau of Reclamation were conducting experiments with electric fish stops, and monitoring mechanical systems between 1928 and 1930. Ernest Brannon of

²⁰Interview with John Shannon, Charles Cobb's successor at Yakima Valley Canal Company, Yakima, Washington, May 1992 and July 1993.

²¹Vander Houwen interview.

²²Ibid.; Shannon interview.

the State Fisheries Department mentioned the Congdon Canal Fish Screen in his 1929 survey journal and his 1930 statistical abstract. In both documents, the Congdon Canal Fish Screen was functioning with perfect efficiency, with no incidence of fish injury or entry into the canal common with the earlier electric systems.²³

By 1933, revolving drum screens began to be installed in most irrigation intakes in the region, funded through state and federal governments, and manned with Works Projects Administration (WPA) workers.²⁴ Charlie Cobb believed that the government had stolen his idea when a crew from the WPA worked on the Congdon Canal. John Shannon maintains that he was with Charlie Cobb, some time later, when Cobb tore down the "patent pending" sign he had placed on the screen, in anger and frustration.²⁵

Charlie Cobb never received any money or credit for his invention. It cannot be proved that he did not take his idea from someone else. Rotary drum technology had other applications in various industries, such as in mixing and filtration systems, previous to that time. However, Cobb's rotary drum fish screen is the earliest known, fully functioning, efficiently operating system in the region; similar designs have subsequently been installed and proliferate throughout the country. Its significant longevity and ingenious simplicity bear testimony to Mr. Cobb's dedication and competence in his work.

²³Ernest Brannon, "Ditch Screen Project - 1929" (unpublished research journal, Washington Department of Fisheries and Game, 1929), pp. 9 and 13; "1930 Report of Fish Found in Irrigation Ditches in Eastern Washington" (Washington Department of Fisheries and Game, 1930), 7/25/30, 7/26/30 and 8/1/30, both documents on file, Washington Department of Fisheries (WDF) Office, Yakima; U.S. Department of the Interior, Bureau of Reclamation, *Annual Project History* (Yakima Federal Reclamation Project): 1928, p. 7; 1929, p. 12; 1934, pp. 2, 14, 114, 118, 119, 193, 196, 243; 1935, pp. 26, 27, 214, 253; 1939, pp. 19, 24; 1940, pp. 20, 21, 26, 240.

²⁴Keith Linton, "Screening program history as per my talk at Ocean Shores meeting, as per your request," memo to Sam Wright, Washington Department of Fisheries, 18 December 1981, on file, WDF, Yakima.

²⁵Vander Houwen interview; Shannon interview.

BIBLIOGRAPHY

- Boone, Charles E. "Chester A. Congdon: Pioneer Irrigationist." Unpublished manuscript, Yakima Valley Canal Company, Yakima, Washington [1969].
- Boreson, Keo. "Congdon Canal Fish Screen." Determination of Eligibility, National Register of Historic Places, 4 October 1990. Archaeological and Historical Services, Eastern Washington University, Cheney.
- Brannon, Ernest. "Ditch Screen Project - 1929." Research Journal, Washington Department of Fisheries and Game, 1929. On file, Washington Department of Fisheries Office, Yakima.
- _____. "1930 Report of Fish Found in Irrigation Ditches in Eastern Washington." Washington Department of Fisheries and Game, 1930.
- Bruce, Robin. "A Finding of Adverse Effect for the Bonneville Power Administration's (BPA) Proposed Congdon Fish Screen Improvements Project, Yakima County, Washington." Report, Archaeological and Historical Services, Eastern Washington University, Cheney, February 1992.
- Eschbach, Eugene. Yakima resident. Interview, Yakima, Washington. August, 1992.
- Eschbach, Robert L. Central Washington Agricultural Museum Association. To Marvin E. Nelson, Bonneville Power Administration, Yakima [n.d.].
- _____. Yakima area resident. Interview, Yakima, August 1992.
- Etcheverry, B.A. *Irrigation Practice and Engineering*. New York: McGraw-Hill Book Company, 1915.
- Garfield, Leonard T. Washington State Office of Archaeology and Historic Preservation (OAHP), Olympia. To Phillip D. Havens, BPA, Portland, 16 January 1991.
- _____. OAHP, Olympia. To Phillip D. Havens, BPA, 10 April 1992.
- Jayne, S.O. "Irrigation in Yakima Valley, Washington." Washington, D.C.: U.S. Department of Agriculture, 1907.
- Linton, Keith. Washington Department of Fisheries. To Sam Wright, Washington Department of Fisheries, 18 December 1981. On file, Washington Department of Fisheries Office, Yakima.
- Look, David W. National Park Service, San Francisco. To Phillip D. Havens, BPA, 7 May 1992.

Lyman, W.D. *History of the Yakima Valley*. 2 Vols. [n.p.]: S.J. Clarke Company, 1919.

Nelson, Marvin E. BPA, Yakima. To Craig Holstine, Archaeological and Historical Services, Eastern Washington University, 24 February 1992.

Netboy, Anthony. *The Columbia River Salmon and Steelhead Trout: Their Fight for Survival*. Seattle: University of Washington Press, 1980.

Pierce's Washington Code, 1905. Seattle: Pierce Publishing, 1905.

Pollock, Charles. Washington Department of Fisheries and Game. To Charles R. Maybury, Washington Department of Fisheries and Game, 14 October 1931. On file, Washington Department of Fisheries Office, Yakima.

Remington's 1915 Codes and Statutes of Washington. 2 Vols. Seattle: Remington Company, 1915.

Session Laws of the State of Washington, 1905. Olympia, 1905.

Session Laws of the State of Washington, 14th Session. Olympia, 1915.

Shannon, John. Yakima Valley Canal Company. Interview, Yakima. May 1992 and July 1993.

Soderberg, Lisa. "OAHP Inventory: Yakima Valley Canal Company System." OAHP, Olympia, 1983.

Spokesman, Review. "Screen Saves Fry in Ranch Ditches." 14 March 1911, p. 9.

U.S. Department of the Interior, Bureau of Reclamation. "Annual Project History - Yakima Federal Reclamation Project." 1928, 1929, 1934, 1935, 1939, and 1940. On file, Bureau of Reclamation Office, Yakima.

U.S. Department of the Interior, Bureau of Reclamation. "Fish Passage and Protective Facilities, Phase II, Yakima River Basin, Washington: Predesign Memorandum - Congdon Canal Fish Screen Facility." Boise, Idaho, January 1991.

Vande Vere, Emmett K. "History of Irrigation in Washington." Ph.D. dissertation, University of Washington, 1948.

Vander Houwen, Mildred. Charles Cobb's daughter. Interview, Yakima, May 1992.

Yakima Daily Republic. "A Desert to Bloom." [Spring] 1895 [n.m/d]. On file, Yakima Valley Canal Company, Yakima.

Yakima Herald. "Glimpse of the Valley's Past." 7 November 1965, p. 6D.

Yakima Morning Herald. "Fish Dam Work Now Under Way." 26 October 1922, p. 8.

Yakima Morning Herald. "Form League to Protect Salmon." 5 November 1922, p. 16.



